

# SEQUENCE LISTING

<110> Dickerson, Harry  
Clark, Theodore G.  
Lin, Tian-Long

<120> DIAGNOSTIC AND PROTECTIVE ANTIGEN GENE SEQUENCES OF  
ICHTHYOPHTHIRIUS

<130> 235.00170101

<140> Unassigned

<141> 2000-02-04

<150> 60/131,121

<151> 1999-04-27

<150> 60/118,634

<151> 1999-02-04

<150> 60/122,372

<151> 1999-03-02

<150> 60/124,905

<151> 1999-03-17

<160> 102

<170> PatentIn Ver. 2.0

<210> 1

<211> 1326

<212> DNA

<213> Ichthyophthirius multifiliis

<400> 1

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tgccaaataa acagagtagg ctctgttacc aatgcaggtg acttagctac tttagccaca 300
taatgcagta cttaatgtcc tactggcact gcacttgatg atggagtgc agatgttttt 360
gatagatcag ccgcataatg tgttaaatgc aaacctaaact tttactataa tgggtggttct 420
ccttaagggtg aagctcctgg cgtttaagtt tttgctgctg gtgctgccgc tgcagggtgtt 480
gctgccgtta ctagttaatg tgtaccttgc caactaaaca aaaacgattc tctgcccact 540
gcagggtgcct aagctaattt agccacataa tgtagcaatt aatgtcctac tggcactgta 600
cttgatgatg gagtgcactt tgtttttaat acatcagcca cattatgtgt taaatgcaga 660
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aatactgcta ctttaagccac ataatgtttg accacatgtc ctgctggtac agtacttgat 1080
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<211> 2486

<212> DNA

<213> Ichthyophthirius multifiliis

<400> 2

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tcttattaaa ataaatacat aaattctagt tgattctttt ttaatattaa tttaaaatta 2040
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aataatattc aatatatttg ttaagggaaa ggttaggcaa actaaactaa attttttaac 2400
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<210> 3

<211> 1404

<212> DNA

<213> *Ichthyophthirius multifiliis*

<400> 3

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cctgcaaatt gtgttaattg ttagaaaaac ttttattata ataatgctgc tgctttcgtt 180
cctggtgcta gtacgtgtac acctgtgtcca taaaaaaaag atgctggtgc ttaaccaaatt 240
ccacctgcta ctgctaattt agtcacataa tgtaacgtta aatgccctgc tggtagcga 300
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aatttttata atgaaaatgc tccaaatttt aatgcagggtg ctagtacatg cacagcttgt 420
ccggtaaaca gagttggtgg tgcattgact gctggtaatg ccgctaccat agtcgcataa 480
tgtaacgtcg catgtcctac tggtagtgca cttgatgatg gagtaactac tgattatgtt 540
agatcattca cagaatgtgt taaatgtaga cttaactttt actataatgg taataatggt 600
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<213> Ichthyophthirius multifiliis

<400> 4

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<211> 1404

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: synthetic  
55kD i-antigen coding region

<400> 5

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cctgctaact gtgtgaactg tcagaagaac ttctactaca acaacgctgc tgctttcgtg 180
cctggagctt ctacctgtac cccttgtcct cagaagaagg acgctggagc tcagcctaac 240
cctcctgcta ccgctaacct ggtgacctag tgtaacgtga agtgcctgc tggaaccgct 300
atcgctggag gagctaccga ctacgctgct atcatcaccg agtgtgtgaa ctgtcgcatc 360
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cctgtgaacc gcgtgggagg agctctgacc gctggaaacg ctgctaccat cgtggctcag 480
tgtaacgtgg cttgtcctac cggaaccgct ctggacgacg gactgaccac cgactacgtg 540
cgctctttca ccgagtgtgt gaagtgtcgc ctgaacttct actacaacgg aaacaacgga 600
aacaccctt tcaaccctgg aaagtctcag tgtaccctt gtccctgctat caagcctgct 660
aacgtggctc aggtctacct gggaaacgac gctaccatca ccgctcagt taacgtggct 720
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<210> 6

<211> 442

<212> PRT

<213> Ichthyophthirius multifiliis

<400> 6

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Glu Leu Arg Ala Val Pro Cys Pro Asp Gly Thr Gln Thr Gln Ala Gly	20	25	30
Leu Thr Asp Val Gly Ala Ala Asp Leu Gly Thr Cys Val Asn Cys Arg	35	40	45
Pro Asn Phe Tyr Tyr Asn Gly Gly Ala Ala Gln Gly Glu Ala Asn Gly	50	55	60
Asn Gln Pro Phe Ala Ala Asn Asn Ala Ala Arg Gly Ile Cys Val Pro	65	70	75
Cys Gln Ile Asn Arg Val Gly Ser Val Thr Asn Ala Gly Asp Leu Ala	85	90	95
Thr Leu Ala Thr Gln Cys Ser Thr Gln Cys Pro Thr Gly Thr Ala Leu	100	105	110
Asp Asp Gly Val Thr Asp Val Phe Asp Arg Ser Ala Ala Gln Cys Val	115	120	125
Lys Cys Lys Pro Asn Phe Tyr Tyr Asn Gly Gly Ser Pro Gln Gly Glu	130	135	140
Ala Pro Gly Val Gln Val Phe Ala Ala Gly Ala Ala Ala Ala Gly Val	145	150	155
Ala Ala Val Thr Ser Gln Cys Val Pro Cys Gln Leu Asn Lys Asn Asp	165	170	175
Ser Pro Ala Thr Ala Gly Ala Gln Ala Asn Leu Ala Thr Gln Cys Ser	180	185	190
Asn Gln Cys Pro Thr Gly Thr Val Leu Asp Asp Gly Val Thr Leu Val	195	200	205
Phe Asn Thr Ser Ala Thr Leu Cys Val Lys Cys Arg Pro Asn Phe Tyr	210	215	220
Tyr Asn Gly Gly Ser Pro Gln Gly Glu Ala Pro Gly Val Gln Val Phe	225	230	235
Ala Ala Gly Ala Ala Ala Ala Gly Val Ala Ala Val Thr Ser Gln Cys	245	250	255
Val Pro Cys Gln Ile Asn Lys Asn Asp Ser Pro Ala Thr Ala Gly Ala			

260	265	270
Gln Ala Asn Leu Ala Thr Gln Cys Ser Thr Gln Cys Pro Thr Gly Thr		
275	280	285
Ala Ile Gln Asp Gly Val Thr Leu Val Phe Ser Asn Ser Ser Thr Gln		
290	295	300
Cys Ser Gln Cys Ile Ala Asn Tyr Phe Phe Asn Gly Asn Phe Glu Ala		
305	310	315
Gly Lys Ser Gln Cys Leu Lys Cys Pro Val Ser Lys Thr Thr Pro Ala		
325	330	335
His Ala Pro Gly Asn Thr Ala Thr Gln Ala Thr Gln Cys Leu Thr Thr		
340	345	350
Cys Pro Ala Gly Thr Val Leu Asp Asp Gly Thr Ser Thr Asn Phe Val		
355	360	365
Ala Ser Ala Thr Glu Cys Thr Lys Cys Ser Ala Gly Phe Phe Ala Ser		
370	375	380
Lys Thr Thr Gly Phe Thr Ala Gly Thr Asp Thr Cys Thr Glu Cys Thr		
385	390	395
Lys Lys Leu Thr Ser Gly Ala Thr Ala Lys Val Tyr Ala Glu Ala Thr		
405	410	415
Gln Lys Val Gln Cys Ala Ser Thr Thr Phe Ala Lys Phe Leu Ser Ile		
420	425	430
Ser Leu Leu Phe Ile Ser Phe Tyr Leu Leu		
435	440	

<210> 7

<211> 468

<212> PRT

<213> Ichthyophthirius multifiliis

<400> 7

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Gln Ile Lys Ser Ala Asn Cys Pro Val Gly Thr Glu Thr Asn Thr Ala
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Gly	Gln	Val	Asp	Asp	Leu	Gly	Thr	Pro	Ala	Asn	Cys	Val	Asn	Cys	Gln	35	40	45	
Lys	Asn	Phe	Tyr	Tyr	Asn	Asn	Ala	Ala	Ala	Phe	Val	Pro	Gly	Ala	Ser	50	55	60	
Thr	Cys	Thr	Pro	Cys	Pro	Gln	Lys	Lys	Asp	Ala	Gly	Ala	Gln	Pro	Asn	65	70	75	80
Pro	Pro	Ala	Thr	Ala	Asn	Leu	Val	Thr	Gln	Cys	Asn	Val	Lys	Cys	Pro	85	90	95	
Ala	Gly	Thr	Ala	Ile	Ala	Gly	Gly	Ala	Thr	Asp	Tyr	Ala	Ala	Ile	Ile	100	105	110	
Thr	Glu	Cys	Val	Asn	Cys	Arg	Ile	Asn	Phe	Tyr	Asn	Glu	Asn	Ala	Pro	115	120	125	
Asn	Phe	Asn	Ala	Gly	Ala	Ser	Thr	Cys	Thr	Ala	Cys	Pro	Val	Asn	Arg	130	135	140	
Val	Gly	Gly	Ala	Leu	Thr	Ala	Gly	Asn	Ala	Ala	Thr	Ile	Val	Ala	Gln	145	150	155	160
Cys	Asn	Val	Ala	Cys	Pro	Thr	Gly	Thr	Ala	Leu	Asp	Asp	Gly	Val	Thr	165	170	175	
Thr	Asp	Tyr	Val	Arg	Ser	Phe	Thr	Glu	Cys	Val	Lys	Cys	Arg	Leu	Asn	180	185	190	
Phe	Tyr	Tyr	Asn	Gly	Asn	Asn	Gly	Asn	Thr	Pro	Phe	Asn	Pro	Gly	Lys	195	200	205	
Ser	Gln	Cys	Thr	Pro	Cys	Pro	Ala	Ile	Lys	Pro	Ala	Asn	Val	Ala	Gln	210	215	220	
Ala	Thr	Leu	Gly	Asn	Asp	Ala	Thr	Ile	Thr	Ala	Gln	Cys	Asn	Val	Ala	225	230	235	240
Cys	Pro	Asp	Gly	Thr	Ile	Ser	Ala	Ala	Gly	Val	Asn	Asn	Trp	Val	Ala	245	250	255	
Gln	Asn	Thr	Glu	Cys	Thr	Asn	Cys	Ala	Pro	Asn	Phe	Tyr	Asn	Asn	Asn	260	265	270	
Ala	Pro	Asn	Phe	Asn	Pro	Gly	Asn	Ser	Thr	Cys	Leu	Pro	Cys	Pro	Ala	275	280	285	

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 290 295 300

Ala Lys Gln Cys Asn Ile Ala Cys Pro Asp Gly Thr Ala Ile Ala Ser  
 305 310 315 320

Gly Ala Thr Asn Tyr Val Ile Leu Gln Thr Glu Cys Leu Asn Cys Ala  
 325 330 335

Ala Asn Phe Tyr Phe Asp Gly Asn Asn Phe Gln Ala Gly Ser Ser Arg  
 340 345 350

Cys Lys Ala Cys Pro Ala Asn Lys Val Gln Gly Ala Val Ala Thr Ala  
 355 360 365

Gly Gly Thr Ala Thr Leu Ile Ala Gln Cys Ala Leu Glu Cys Pro Ala  
 370 375 380

Gly Thr Val Leu Thr Asp Gly Thr Thr Ser Thr Tyr Lys Gln Ala Ala  
 385 390 395 400

Ser Glu Cys Val Lys Cys Ala Ala Asn Phe Tyr Thr Thr Lys Gln Thr  
 405 410 415

Asp Trp Val Ala Gly Ile Asp Thr Cys Thr Ser Cys Asn Lys Lys Leu  
 420 425 430

Thr Ser Gly Ala Glu Ala Asn Leu Pro Glu Ser Ala Lys Lys Asn Ile  
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Gln Cys Asp Phe Ala Asn Phe Leu Ser Ile Ser Leu Leu Leu Ile Ser  
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Tyr Tyr Leu Leu  
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<210> 8  
 <211> 83  
 <212> PRT  
 <213> Ichthyophthirius multifiliis

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Ala Asp Leu Gly Thr Cys Val Asn Cys Arg Pro Asn Phe Tyr Tyr Asn  
 20 25 30



Gly Gly Ala Ala Gln Gly Glu Ala Asn Gly Asn Gln Pro Phe Ala Ala  
           35                          40                          45  
 Asn Asn Ala Ala Arg Gly Ile Cys Val Pro Cys Gln Ile Asn Arg Val  
           50                          55                          60  
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           65                          70                          75                          80  
 Ser Thr Gln

<210> 9  
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 <212> PRT  
 <213> Ichthyophthirius multifiliis

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                           20                          25                          30  
 Gly Gly Ser Pro Gln Gly Glu Ala Pro Gly Val Gln Val Phe Ala Ala  
           35                          40                          45  
 Gly Ala Ala Ala Ala Gly Val Ala Ala Val Thr Ser Gln Cys Val Pro  
           50                          55                          60  
 Cys Gln Leu Asn Lys Asn Asp Ser Pro Ala Thr Ala Gly Ala Gln Ala  
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 Asn Leu Ala Thr Gln Cys Ser Asn Gln  
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 <213> Ichthyophthirius multifiliis

<400> 10  
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Thr Ser Ala Thr Leu Cys Val Lys Cys Arg Pro Asn Phe Tyr Tyr Asn  
           20                          25                          30  
 Gly Gly Ser Pro Gln Gly Glu Ala Pro Gly Val Gln Val Phe Ala Ala  
           35                          40                          45  
 Gly Ala Ala Ala Ala Gly Val Ala Ala Val Thr Ser Gln Cys Val Pro  
           50                          55                          60  
 Cys Gln Ile Asn Lys Asn Asp Ser Pro Ala Thr Ala Gly Ala Gln Ala  
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 Gly Asn Phe Glu Ala Gly Lys Ser Gln Cys Leu Lys Cys Pro Val Ser  
           35                          40                          45  
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 <213> Ichthyophthirius multifiliis

<400> 12  
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20                      25                      30  
 Lys Thr Thr Gly Phe Thr Ala Gly Thr Asp Thr Cys Thr Glu Cys Thr  
                     35                      40                      45  
 Lys Lys Leu Thr Ser Gly Ala Thr Ala Lys Val Tyr Ala Glu Ala Thr  
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 Gln Lys Val Gln Cys Ala Ser Thr  
                     65                      70

<210> 13  
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 <212> PRT  
 <213> Ichthyophthirius multifiliis

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                     1                      5                      10

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Phe Ile Ser Phe Tyr Leu Leu  
                     20

<210> 15  
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<400> 15  
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                     1                      5                      10                      15

Gln Ile Lys Ser  
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<210> 16  
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Tyr Tyr Leu Leu  
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<210> 18  
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 <213> Ichthyophthirius multifiliis

<400> 18  
 Lys Val Tyr Ala Glu Ala Thr Gln Lys Val Gln Cys Ala Ser Thr Thr  
 1 5 10 15

Phe Ala Lys Phe Leu Ser Ile Ser Leu Leu Phe Ile Ser Phe Tyr Leu  
 20 25 30

Leu

<210> 19  
 <211> 60  
 <212> DNA  
 <213> Ichthyophthirius multifiliis

<400> 19  
 atgaaaaata atatttttagt aatattgatt atttcattat ttatcaatta aattaaatct 60

<210> 20

<211> 60  
 <212> DNA  
 <213> *Ichthyophthirius multifiliis*

<400> 20  
 taatgtgatt tcgctaattt tttatcaatt tccttattat tgatttctta ttatttatta 60

<210> 21  
 <211> 24  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence: antisense  
 primer

<400> 21  
 agcagcacct acatcagtc aatcc 24

<210> 22  
 <211> 17  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence: universal  
 primer

<400> 22  
 gtaaaacgac ggccagt 17

<210> 23  
 <211> 40  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence: EPBdT18  
 primer

<400> 23  
 gcgaattctg caggatccaa actttttttt tttttttttt 40

<210> 24  
 <211> 26  
 <212> DNA  
 <213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: forward  
primer

<400> 24

gtgtcgacag caggtactga tacatg

26

<210> 25

<211> 24

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: forward  
primer

<400> 25

cgaaaacagt ggtggtagta cctt

24

<210> 26

<211> 22

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: reverse  
primer

<400> 26

gcgaattctg caggatccaa ac

22

<210> 27

<211> 24

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:  
oligonucleotide probe

<400> 27

agcagcacca acatcagtca aacc

24

<210> 28

<211> 28

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: forward  
primer

<400> 28

atggaatta acctttcgca gcaaataa

28

<210> 29

<211> 20

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: reverse  
primer

<400> 29

ggtctgcatt taacacataa

20

<210> 30

<211> 20

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: reverse  
primer

<400> 30

agatacatca gtatacgaaa

20

<210> 31

<211> 4

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primary  
structure motif

<400> 31

Cys Xaa Xaa Cys

1

<210> 32

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primary  
structure motif

<400> 32

Cys Xaa Xaa Xaa Cys  
1 5

<210> 33

<211> 53

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: repeating  
primary structure motif

<400> 33

Cys Xaa Xaa Cys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
1 5 10 15

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Cys Xaa Xaa Xaa Cys Xaa Xaa Xaa  
20 25 30

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
35 40 45

Xaa Cys Xaa Xaa Cys  
50

<210> 34

<211> 8

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: i-antigen  
P-loop domain

<400> 34

Gly Xaa Xaa Xaa Xaa Gly Lys Ser  
1 5



<210> 35  
 <211> 24  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence: sense primer

<400> 35  
 atgaaataya ayattttatt aatt 24

<210> 36  
 <211> 8  
 <212> PRT  
 <213> Ichthyophthirius multifiliis

<400> 36  
 Met Lys Tyr Asn Ile Leu Leu Thr  
 1 5

<210> 37  
 <211> 24  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence: antisense  
 primer

<400> 37  
 aaataataar gaaatmgata aaaa 24

<210> 38  
 <211> 8  
 <212> PRT  
 <213> Ichthyophthirius multifiliis

<400> 38  
 Phe Leu Ser Ile Ser Leu Leu Phe  
 1 5

<210> 39  
 <211> 26  
 <212> DNA  
 <213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: antisense  
primer

<400> 39

tgctcgagaa tctgttgctc cacctg

26

<210> 40

<211> 52

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: forward  
primer

<400> 40

ccagtgcgca gaggacgag gactcgagct caagcccccc cccccccccc cc

52

<210> 41

<211> 18

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: forward  
primer

<400> 41

gaggactcga gctcaagc

18

<210> 42

<211> 27

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: reverse  
primer

<400> 42

aactcgagta ccagcagggc atttaac

27

<210> 43

<211> 23

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: primer

<400> 43

cacaccttgt ccggcaatta aac

23

<210> 44

<211> 1410

<212> DNA

<213> Ichthyophthirius multifiliis

<400> 44

atgaaaaata atatttttagt aatattgatt atttcattat ttatcaatta aattaaatct 60  
gctaattgtc ctggttgaac tgaaactaac acagccggat aagttgatga tctaggaact 120  
cctgcaaatt gtgttaattg ttagaaaaaac ttttattata ataatgctgc tgctttcgtt 180  
cctggtgcta gtacgtgtac acctgtgtcca taaaaaaaag atgctggtgc ttaaccaaact 240  
ccacctgcta ctgctaattt agtcacataa tgtaacgtta aatgccctgc tggtagccga 300  
attgcagggtg gagcaacaga ttatgcagca ataatcacag aatgtgttaa ttgtagaatt 360  
aattttttata atgaaaatgc tccaaatttt aatgcagggtg ctagtacatg cacagcttgt 420  
ccggtaaaaca gagttggtgg tgcattgact gctggtaatg ccgctaccat agtcgcataa 480  
tgtaacgtcg catgtcctac tggtagctga cttgatgatg gagtaactac tgattatgtt 540  
agatcattca cagaatgtgt taaatgtaga cttaactttt actataatgg taataatggt 600  
aatactcctt tcaatccagg taaaagttaa tgcacacctt gtccggcaat taaacctgct 660  
aatgttgctt aagctacttt aggtaatgat gctacaataa ccgcataatg taacgttgca 720  
tgccctgatg gtactataag tgctgctgga gtaaataatt gggtagcaca aaacactgaa 780  
tgtactaatt gtgctcctaa cttttacaat aataatgctc ctaatttcaa tccaggtaat 840  
agtacatgcc taccttgccc agcaaataaa gattatggtg ctgaagccac tgcagggtgt 900  
gccgctactt tagccaaata atgtaatatt gcatgccctg atggtactgc aattgctagt 960  
ggagcaacta attatgtaat attataaaca gaatgtctaa attgtgctgc taacttttat 1020  
tttgatggta ataatttcta ggcaggaagt agtagatgca aagcatgtcc agcaaataaa 1080  
gtttaaggcg ctgtagcaac tgcagggtgt actgctactt taattgcata atgtgccctt 1140  
gaatgccctg ctggtactgt actcaccgat ggaacaacat ctacttataa ataagcagca 1200  
tctgaatgtg ttaaatgtgc tgccaacttt tatactacaa aataaactga ttgggtagca 1260  
ggatttgata catgtactag ttgtaataaa aaattaactt ctggcgctga agctaattta 1320  
cctgaatctg ctaaaaaaaa tatataatgt gatttcgcta attttttatc aatttcctta 1380  
ttattgattt cttattattt attatgatga 1410

<210> 45

<211> 33

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: forward  
primer

<400> 45

ccgaattctc tgggactgca cttgatgatg gag

33

<210> 46  
<211> 8  
<212> PRT  
<213> Ichthyophthirius multifiliis

<400> 46  
Gly Thr Ala Leu Asp Asp Gly Val  
1 5

<210> 47  
<211> 29  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence: reverse  
primer

<400> 47  
gtggatccag tacatgttac artacctgc

29

<210> 48  
<211> 7  
<212> PRT  
<213> Ichthyophthirius multifiliis

<400> 48  
Ala Gly Thr Asp Thr Cys Thr  
1 5

<210> 49  
<211> 31  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence: reverse  
primer

<400> 49  
gtggatccrc cagaagttaa ttttttakta c

31

<210> 50  
<211> 9  
<212> PRT

<213> Ichthyophthirius multifiliis

<400> 50

Cys Thr Lys Lys Leu Thr Ser Gly Ala  
1 5

<210> 51

<211> 32

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: reverse  
primer

<400> 51

gtggatccaa ggaaatygat aaaaawttag cg

32

<210> 52

<211> 9

<212> PRT

<213> Ichthyophthirius multifiliis

<400> 52

Phe Ala Lys Phe Leu Ser Ile Ser Leu  
1 5

<210> 53

<211> 1404

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: synthetic G5  
proline mutant i-antigen

<400> 53

atgaagaaca acatcccggg gatcctgac atctctctgt tcatcaacca gatcaagtct 60  
gctaactgtc ctgtgggaac cgagaccaac accgctggac aggtggacga cctgggaacc 120  
cctgctaact gtgtgaactg tcagaagaac ttctactaca acaacgctgc tgctttcgtg 180  
cctggagctt ctacctgtac cccttgctcct cagaagaagg acgctggagc tcagcctaac 240  
cctcctgcta ccgctaacct ggtgacccag tgtaacgtga agtgtcctgc tggaaaccgt 300  
atcgctggag gagctaccga ctacgctgct atcatcacg agtgtgtgaa ctgtcgcac 360  
aacttctaca acgagaacgc tcctaacttc aacgctggag cttctacctg taccgcttgt 420  
cctgtgaacc gtgtgggagg agctctgacc gctggaaacg ctgctaccat cgtggctcag 480  
tgtaacgtgg cttgtcctac cggaaccgct ctggacgacg gagtgaccac cgactacgtg 540

cgctctttca ccgagtgtgt gaagtgtcgc ctgaacttct actacaacgg aaacaacgga 600  
 aacacccctt tcaaccctgg aaagtctcag tgtaccctt gtcctgctat caagcctgct 660  
 aacgtggctc aggtaccct gggaaacgac gctaccatca ccgctcagt taacgtggct 720  
 tgtcctgacg gaaccatctc tgctgctgga gtgaacaact gggtggtca gaacaccgag 780  
 tgtaccaact gtgctcctaa cttctacaac aacaacgctc ctaacttcaa ccctggaaac 840  
 tctacctgtc tgccttgtcc tgctaacaag gactacggag ctgaggctac cgctggagga 900  
 gctgctaccc tggctaagca gtgtaacatc gcttgtcctg acggaaccgc tatcgcttct 960  
 ggagctacca actacgtgat cctgcagacc gagtgtctga actgtgctgc taacttctac 1020  
 ttcgacggaa acaacttcca ggctggatct tctcgctgta aggcttgtcc tgctaacaag 1080  
 gtgcagggag ctgtggctac cgctggagga accgctaccc tgatcgctca gtgtgctctg 1140  
 gagtgtcctg ctggaaccgt gctgaccgac ggaaccacct ctacctaaa gcaggctgct 1200  
 tctgagtgtg tgaagtgtgc tgctaacttc tacaccacca agcagaccga ctgggtggct 1260  
 ggaatcgaca cctgtacctc ttgtaacaag aagctgacct ctggagctga ggctaacctg 1320  
 cctgagtctg ctaagaagaa catccagtgt gacttcgcta acttcctgtc tatctctctg 1380  
 ctgctgatct cttactacct gctg 1404

<210> 54

<211> 468

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: synthetic G5  
proline mutant antigen protein

<400> 54

Met Lys Asn Asn Ile Pro Val Ile Leu Ile Ile Ser Leu Phe Ile Asn  
1 5 10 15

Gln Ile Lys Ser Ala Asn Cys Pro Val Gly Thr Glu Thr Asn Thr Ala  
20 25 30

Gly Gln Val Asp Asp Leu Gly Thr Pro Ala Asn Cys Val Asn Cys Gln  
35 40 45

Lys Asn Phe Tyr Tyr Asn Asn Ala Ala Ala Phe Val Pro Gly Ala Ser  
50 55 60

Thr Cys Thr Pro Cys Pro Gln Lys Lys Asp Ala Gly Ala Gln Pro Asn  
65 70 75 80

Pro Pro Ala Thr Ala Asn Leu Val Thr Gln Cys Asn Val Lys Cys Pro  
85 90 95

Ala Gly Thr Ala Ile Ala Gly Gly Ala Thr Asp Tyr Ala Ala Ile Ile  
100 105 110

Thr Glu Cys Val Asn Cys Arg Ile Asn Phe Tyr Asn Glu Asn Ala Pro

115	120	125
Asn Phe Asn Ala Gly Ala Ser Thr Cys Thr Ala Cys Pro Val Asn Arg		
130	135	140
Val Gly Gly Ala Leu Thr Ala Gly Asn Ala Ala Thr Ile Val Ala Gln		
145	150	155
Cys Asn Val Ala Cys Pro Thr Gly Thr Ala Leu Asp Asp Gly Val Thr		
165	170	175
Thr Asp Tyr Val Arg Ser Phe Thr Glu Cys Val Lys Cys Arg Leu Asn		
180	185	190
Phe Tyr Tyr Asn Gly Asn Asn Gly Asn Thr Pro Phe Asn Pro Gly Lys		
195	200	205
Ser Gln Cys Thr Pro Cys Pro Ala Ile Lys Pro Ala Asn Val Ala Gln		
210	215	220
Ala Thr Leu Gly Asn Asp Ala Thr Ile Thr Ala Gln Cys Asn Val Ala		
225	230	235
Cys Pro Asp Gly Thr Ile Ser Ala Ala Gly Val Asn Asn Trp Val Ala		
245	250	255
Gln Asn Thr Glu Cys Thr Asn Cys Ala Pro Asn Phe Tyr Asn Asn Asn		
260	265	270
Ala Pro Asn Phe Asn Pro Gly Asn Ser Thr Cys Leu Pro Cys Pro Ala		
275	280	285
Asn Lys Asp Tyr Gly Ala Glu Ala Thr Ala Gly Gly Ala Ala Thr Leu		
290	295	300
Ala Lys Gln Cys Asn Ile Ala Cys Pro Asp Gly Thr Ala Ile Ala Ser		
305	310	315
Gly Ala Thr Asn Tyr Val Ile Leu Gln Thr Glu Cys Leu Asn Cys Ala		
325	330	335
Ala Asn Phe Tyr Phe Asp Gly Asn Asn Phe Gln Ala Gly Ser Ser Arg		
340	345	350
Cys Lys Ala Cys Pro Ala Asn Lys Val Gln Gly Ala Val Ala Thr Ala		
355	360	365
Gly Gly Thr Ala Thr Leu Ile Ala Gln Cys Ala Leu Glu Cys Pro Ala		

370

375

380

Gly Thr Val Leu Thr Asp Gly Thr Thr Ser Thr Tyr Lys Gln Ala Ala  
385 390 395 400

Ser Glu Cys Val Lys Cys Ala Ala Asn Phe Tyr Thr Thr Lys Gln Thr  
405 410 415

Asp Trp Val Ala Gly Ile Asp Thr Cys Thr Ser Cys Asn Lys Lys Leu  
420 425 430

Thr Ser Gly Ala Glu Ala Asn Leu Pro Glu Ser Ala Lys Lys Asn Ile  
435 440 445

Gln Cys Asp Phe Ala Asn Phe Leu Ser Ile Ser Leu Leu Leu Ile Ser  
450 455 460

Tyr Tyr Leu Leu  
465

&lt;210&gt; 55

&lt;211&gt; 72

&lt;212&gt; PRT

&lt;213&gt; Ichthyophthirius multifiliis

&lt;400&gt; 55

Cys Pro Val Gly Thr Glu Thr Asn Thr Ala Gly Gln Val Asp Asp Leu  
1 5 10 15

Gly Thr Pro Ala Asn Cys Val Asn Cys Gln Lys Asn Phe Tyr Tyr Asn  
20 25 30

Asn Ala Ala Ala Phe Val Pro Gly Ala Ser Thr Cys Thr Pro Cys Pro  
35 40 45

Gln Lys Lys Asp Ala Gly Ala Gln Pro Asn Pro Pro Ala Thr Ala Asn  
50 55 60

Leu Val Thr Gln Cys Asn Val Lys  
65 70

&lt;210&gt; 56

&lt;211&gt; 70

&lt;212&gt; PRT

&lt;213&gt; Ichthyophthirius multifiliis



<400> 56

Cys Pro Ala Gly Thr Ala Ile Ala Gly Gly Ala Thr Asp Tyr Ala Ala  
1 5 10 15

Ile Ile Thr Glu Cys Val Asn Cys Arg Ile Asn Phe Tyr Asn Glu Asn  
20 25 30

Ala Pro Asn Phe Asn Ala Gly Ala Ser Thr Cys Thr Ala Cys Pro Val  
35 40 45

Asn Arg Val Gly Gly Ala Leu Thr Ala Gly Asn Ala Ala Thr Ile Val  
50 55 60

Ala Gln Cys Asn Val Ala  
65 70

<210> 57

<211> 76

<212> PRT

<213> Ichthyophthirius multifiliis

<400> 57

Cys Pro Thr Gly Thr Ala Leu Asp Asp Gly Val Thr Thr Asp Tyr Val  
1 5 10 15

Arg Ser Phe Thr Glu Cys Val Lys Cys Arg Leu Asn Phe Tyr Tyr Asn  
20 25 30

Gly Asn Asn Gly Asn Thr Pro Phe Asn Pro Gly Lys Ser Gln Cys Thr  
35 40 45

Pro Cys Pro Ala Ile Lys Pro Ala Asn Val Ala Gln Ala Thr Leu Gly  
50 55 60

Asn Asp Ala Thr Ile Thr Ala Gln Cys Asn Val Ala  
65 70 75

<210> 58

<211> 71

<212> PRT

<213> Ichthyophthirius multifiliis

<400> 58

Cys Pro Asp Gly Thr Ile Ser Ala Ala Gly Val Asn Asn Trp Val Ala  
1 5 10 15

Gln Asn Thr Glu Cys Thr Asn Cys Ala Pro Asn Phe Tyr Asn Asn Asn  
 20 25 30

Ala Pro Asn Phe Asn Pro Gly Asn Ser Thr Cys Leu Pro Cys Pro Ala  
 35 40 45

Asn Lys Asp Tyr Gly Ala Glu Ala Thr Ala Gly Gly Ala Ala Thr Leu  
 50 55 60

Ala Lys Gln Cys Asn Ile Ala  
 65 70

<210> 59

<211> 70

<212> PRT

<213> Ichthyophthirius multifiliis

<400> 59

Cys Pro Asp Gly Thr Ala Ile Ala Ser Gly Ala Thr Asn Tyr Val Ile  
 1 5 10 15

Leu Gln Thr Glu Cys Leu Asn Cys Ala Ala Asn Phe Tyr Phe Asp Gly  
 20 25 30

Asn Asn Phe Gln Ala Gly Ser Ser Arg Cys Lys Ala Cys Pro Ala Asn  
 35 40 45

Lys Val Gln Gly Ala Val Ala Thr Ala Gly Gly Thr Ala Thr Leu Ile  
 50 55 60

Ala Gln Cys Ala Leu Glu  
 65 70

<210> 60

<211> 72

<212> PRT

<213> Ichthyophthirius multifiliis

<400> 60

Cys Pro Ala Gly Thr Val Leu Thr Asp Gly Thr Thr Ser Thr Tyr Lys  
 1 5 10 15

Gln Ala Ala Ser Glu Cys Val Lys Cys Ala Ala Asn Phe Tyr Thr Thr  
 20 25 30

Lys Gln Thr Asp Trp Val Ala Gly Ile Asp Thr Cys Thr Ser Cys Asn

	35		40		45										
Lys	Lys	Leu	Thr	Ser	Gly	Ala	Glu	Ala	Asn	Leu	Pro	Glu	Ser	Ala	Lys
	50				55					60					
Lys	Asn	Ile	Gln	Cys	Asp	Phe	Ala								
	65				70										
<210> 61															
<211> 409															
<212> PRT															
<213> Ichthyophthirius multifiliis															
<400> 61															
Ala	Val	Pro	Cys	Pro	Asp	Gly	Thr	Gln	Thr	Gln	Ala	Gly	Leu	Thr	Asp
1				5				10					15		
Val	Gly	Ala	Ala	Asp	Leu	Gly	Thr	Cys	Val	Asn	Cys	Arg	Pro	Asn	Phe
			20					25					30		
Tyr	Tyr	Asn	Gly	Gly	Ala	Ala	Gln	Gly	Glu	Ala	Asn	Gly	Asn	Gln	Pro
		35					40					45			
Phe	Ala	Ala	Asn	Asn	Ala	Ala	Arg	Gly	Ile	Cys	Val	Pro	Cys	Gln	Ile
	50					55					60				
Asn	Arg	Val	Gly	Ser	Val	Thr	Asn	Ala	Gly	Asp	Leu	Ala	Thr	Leu	Ala
	65					70				75				80	
Thr	Gln	Cys	Ser	Thr	Gln	Cys	Pro	Thr	Gly	Thr	Ala	Leu	Asp	Asp	Gly
				85					90					95	
Val	Thr	Asp	Val	Phe	Asp	Arg	Ser	Ala	Ala	Gln	Cys	Val	Lys	Cys	Lys
			100					105					110		
Pro	Asn	Phe	Tyr	Tyr	Asn	Gly	Gly	Ser	Pro	Gln	Gly	Glu	Ala	Pro	Gly
		115					120					125			
Val	Gln	Val	Phe	Ala	Ala	Gly	Ala	Ala	Ala	Ala	Gly	Val	Ala	Ala	Val
	130					135					140				
Thr	Ser	Gln	Cys	Val	Pro	Cys	Gln	Leu	Asn	Lys	Asn	Asp	Ser	Pro	Ala
	145				150					155					160
Thr	Ala	Gly	Ala	Gln	Ala	Asn	Leu	Ala	Thr	Gln	Cys	Ser	Asn	Gln	Cys
				165					170					175	

Pro Thr Gly Thr Val Leu Asp Asp Gly Val Thr Leu Val Phe Asn Thr  
180 185 190

Ser Ala Thr Leu Cys Val Lys Cys Arg Pro Asn Phe Tyr Tyr Asn Gly  
195 200 205

Gly Ser Pro Gln Gly Glu Ala Pro Gly Val Gln Val Phe Ala Ala Gly  
210 215 220

Ala Ala Ala Ala Gly Val Ala Ala Val Thr Ser Gln Cys Val Pro Cys  
225 230 235 240

Gln Ile Asn Lys Asn Asp Ser Pro Ala Thr Ala Gly Ala Gln Ala Asn  
245 250 255

Leu Ala Thr Gln Cys Ser Thr Gln Cys Pro Thr Gly Thr Ala Ile Gln  
260 265 270

Asp Gly Val Thr Leu Val Phe Ser Asn Ser Ser Thr Gln Cys Ser Gln  
275 280 285

Cys Ile Ala Asn Tyr Phe Phe Asn Gly Asn Phe Glu Ala Gly Lys Ser  
290 295 300

Gln Cys Leu Lys Cys Pro Val Ser Lys Thr Thr Pro Ala His Ala Pro  
305 310 315 320

Gly Asn Thr Ala Thr Gln Ala Thr Gln Cys Leu Thr Thr Cys Pro Ala  
325 330 335

Gly Thr Val Leu Asp Asp Gly Thr Ser Thr Asn Phe Val Ala Ser Ala  
340 345 350

Thr Glu Cys Thr Lys Cys Ser Ala Gly Phe Phe Ala Ser Lys Thr Thr  
355 360 365

Gly Phe Thr Ala Gly Thr Asp Thr Cys Thr Glu Cys Thr Lys Lys Leu  
370 375 380

Thr Ser Gly Ala Thr Ala Lys Val Tyr Ala Glu Ala Thr Gln Lys Val  
385 390 395 400

Gln Cys Ala Ser Thr Thr Phe Ala Lys  
405

<210> 62

<211> 399

<212> PRT

<213> Giardia lamblia virus

<400> 62

Ala Val Asp Cys Gln Gly Ser Ala Gly Tyr Tyr Thr Asp Asp Ser Val  
1 5 10 15

Ser Asp Ala Lys Glu Cys Lys Lys Cys Asn Ala Pro Cys Thr Ala Cys  
20 25 30

Ala Gly Thr Ala Asp Lys Cys Thr Lys Cys Asp Ala Asn Gly Ala Ala  
35 40 45

Pro Tyr Leu Lys Lys Thr Asn Pro Ser Asp Pro Thr Gly Thr Cys Val  
50 55 60

Ser Ala Val Asp Cys Gln Gly Ser Ala Gly Tyr Tyr Thr Asp Asp Ser  
65 70 75 80

Val Ser Asp Ala Lys Glu Cys Lys Lys Cys Ala Glu Gly Gln Lys Pro  
85 90 95

Asn Thr Ala Gly Thr Gln Cys Phe Ser Cys Ser Asp Ala Asn Cys Glu  
100 105 110

Arg Cys Asp Gln Asn Asp Val Cys Ala Arg Cys Ser Thr Gly Ala Pro  
115 120 125

Pro Glu Asn Gly Lys Cys Pro Ala Ala Thr Pro Gly Cys His Ser Ser  
130 135 140

Cys Asp Gly Cys Thr Glu Asn Ala Met Thr Asn Gln Ala Asp Lys Cys  
145 150 155 160

Thr Gly Cys Lys Glu Gly Arg Tyr Leu Lys Pro Glu Ser Ala Ala Gly  
165 170 175

Gln Ser Gly Thr Cys Leu Thr Ala Glu Glu Cys Thr Ser Asp Thr Thr  
180 185 190

His Phe Thr Lys Glu Lys Ala Gly Asp Ser Lys Gly Met Cys Leu Pro  
195 200 205

Cys Ser Asp Ala Thr His Gly Ile Ala Gly Cys Lys Lys Cys Ala Leu  
210 215 220

Lys Thr Leu Ser Gly Glu Ala Glu Ser Thr Val Val Cys Ser Glu Cys  
225 230 235 240



gtaaatatcc attaatgaag cttcgaaaac agtggtggtgta gtaccttatt catgcttgaa 60  
gtatttagaa tcaagag 77

<210> 65

<211> 33

<212> PRT

<213> Ichthyophthirius multifiliis

<400> 65

Lys Val Tyr Ala Glu Ala Thr Gln Lys Val Gln Cys Ala Ser Thr Thr  
1 5 10 15

Phe Ala Lys Phe Leu Ser Ile Ser Leu Leu Phe Ile Ser Phe Tyr Leu  
20 25 30

Leu

<210> 66

<211> 202

<212> DNA

<213> Ichthyophthirius multifiliis

<400> 66

aaagtatatg ctgaagctac tcaaaaagta taatgcgcct ccactacttt cgctaaattt 60  
ttatcgattt ccttattatt tatttctttc tatttattgt gatgaataaa ataattcata 120  
ttattttatt tttttatttt atgtttataa attaaaaaat agataaaatt taaaatatat 180  
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<210> 67

<211> 199

<212> DNA

<213> Ichthyophthirius multifiliis

<400> 67

aaagtatatg ctgaagctac tcaaaaagta taatgcgcct ccactacttt cgctaaattt 60  
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ttattttatt tttttatttt atgtttataa attaaaaaat agataaaatt taaaatatat 180  
taaaaaaaaa aaaaaaaaaa 199

<210> 68

<211> 162

<212> DNA

<213> Ichthyophthirius multifiliis

<400> 68

aaagtatatg ctgaagctac tcaaaaagta taatgcgcct ccactacttt cgctaaattt 60

ttatcgattt ccttattatt tatttctttc tatttattgt gatgaataaa ataattcata 120  
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<210> 69  
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 <213> Ichthyophthirius multifiliis

<400> 69  
 aaagtatatg ctgaagctac tcaaaaagta taatg'gcct ccactacttt cgctaaattt 60  
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 <223> Description of Artificial Sequence:  
 oligonucleotide primers

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 cagatcaagt ctgctaactg tcctgtggga accgagacca acaccgctgg acagggtg 117

<210> 71  
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 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence:  
 oligonucleotide primers

<400> 71  
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 tagcaggggt tcccaggctg tccacctgtc cagcgggtgt ggtc 104

<210> 72  
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 <213> Artificial Sequence

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 <223> Description of Artificial Sequence:  
 oligonucleotide primers

<400> 72



cgctgctgct ttcgtgcctg gagcttctac ctgtaccctc tgtcctcaga agaaggacgc 60  
 tggagctcag cctaaccctc ctgctaccgc taacctggtg 100

<210> 73  
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 <212> DNA  
 <213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:  
 oligonucleotide primers

<400> 73  
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 gttacactgg gtcaccaggt tagcggtagc aggag 95

<210> 74  
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 <212> DNA  
 <213> Artificial Sequence

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<223> Description of Artificial Sequence:  
 oligonucleotide primers

<400> 74  
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 gtgggaggag ctctgacc 138

<210> 75  
 <211> 123  
 <212> DNA  
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<223> Description of Artificial Sequence:  
 oligonucleotide primers

<400> 75  
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 gcg 123

<210> 76  
 <211> 99  
 <212> DNA  
 <213> Artificial Sequence

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<223> Description of Artificial Sequence:  
oligonucleotide primers

<400> 76

gactacgtgc gctctttcac cgagtgtgtg aagtgtcgcc tgaacttcta ctacaacgga 60  
aacaacggaa acacccttt caaccctgga aagtctcag 99

<210> 77

<211> 95

<212> DNA

<213> Artificial Sequence

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<223> Description of Artificial Sequence:  
oligonucleotide primers

<400> 77

gtgatggtag cgtcgtttcc cagggtagcc tgagccacgt tagcaggctt gatagcagga 60  
caaggggtac actgagactt tccaggggtg aaagg 95

<210> 78

<211> 94

<212> DNA

<213> Artificial Sequence

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<223> Description of Artificial Sequence:  
oligonucleotide primers

<400> 78

gggaaacgac gctaccatca ccgctcagtg taacgtggct tgtcctgacg gaaccatctc 60  
tgctgctgga gtgaacaact gggtggtca gaac 94

<210> 79

<211> 100

<212> DNA

<213> Artificial Sequence

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<223> Description of Artificial Sequence:  
oligonucleotide primers

<400> 79

cagacaggta gagtttccag ggttgaagtt aggagcgttg ttgttgtaga agttaggagc 60  
acagttggtg cactcgggtg tctgagccac ccagttgttc 100

<210> 80  
<211> 89  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence:  
oligonucleotide primers

<400> 80  
ccctggaaac tctacctgtc tgccttgtcc tgctaacaag gactacggag ctgaggctac 60  
cgctggagga gctgctaccc tggctaagc 89

<210> 81  
<211> 90  
<212> DNA  
<213> Artificial Sequence

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<223> Description of Artificial Sequence:  
oligonucleotide primers

<400> 81  
ggctctgcagg atcacgtagt tggtagctcc agaagcgata gcggttccgt caggacaagc 60  
gatgttacac tgcttagcca gggtagcagc 90

<210> 82  
<211> 95  
<212> DNA  
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<223> Description of Artificial Sequence:  
oligonucleotide primers

<400> 82  
caactacgtg atcctgcaga ccgagtgtct gaactgtgct gctaacttct acttcgacgg 60  
aaacaacttc caggctggat cttctcgctg taagg 95

<210> 83  
<211> 92  
<212> DNA  
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<223> Description of Artificial Sequence:  
oligonucleotide primers

<400> 83  
gagcgatcag ggtagcgggt cctccagcgg tagccacagc tccctgcacc ttgttagcag 60  
gacaagcctt acagcgagaa gatccagcct gg 92

<210> 84  
<211> 94  
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<220>  
<223> Description of Artificial Sequence:  
oligonucleotide primers

<400> 84  
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acggaaccac ctctacctac aagcaggctg cttc 94

<210> 85  
<211> 92  
<212> DNA  
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oligonucleotide primers

<400> 85  
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cacacactca gaagcagcct gctttaggt ag 92

<210> 86  
<211> 92  
<212> DNA  
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<220>  
<223> Description of Artificial Sequence:  
oligonucleotide primers

<400> 86  
gggtggctgg aatcgacacc tgtacctctt gtaacaagaa gctgacctct ggagctgagg 60  
ctaacctgcc tgagtctgct aagaagaaca tc 92

<210> 87  
<211> 95  
<212> DNA  
<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:  
oligonucleotide primers

<400> 87

gagggatcct tattacagca ggtagtaaga gatcagcagc agagagatag acaggaagtt 60  
agcgaagtca cactggatgt tcttcttagc agact 95

<210> 88

<211> 52

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: repeating  
primary structure motif

<400> 88

Cys Xaa Xaa Cys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
1 5 10 15

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Cys Xaa Xaa Xaa Cys Pro Xaa Xaa  
20 25 30

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
35 40 45

Cys Xaa Xaa Cys  
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<210> 89

<211> 58

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: repeating  
primary structure motif

<400> 89

Cys Xaa Xaa Cys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
1 5 10 15

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Gln Cys Xaa Xaa Xaa Cys Pro Xaa  
20 25 30

Gly Thr Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa

35

40

45

Xaa Xaa Xaa Xaa Xaa Xaa Cys Xaa Xaa Cys  
 50 55

&lt;210&gt; 90

&lt;211&gt; 16

&lt;212&gt; PRT

&lt;213&gt; Ichthyophthirius multifiliis

&lt;400&gt; 90

Met Lys Tyr Asn Ile Leu Leu Ile Leu Ile Ile Ser Leu Phe Ile Asn  
 1 5 10 15

&lt;210&gt; 91

&lt;211&gt; 16

&lt;212&gt; PRT

&lt;213&gt; Ichthyophthirius multifiliis

&lt;400&gt; 91

Met Lys Asn Asn Ile Leu Val Ile Leu Ile Ile Ser Leu Phe Ile Asn  
 1 5 10 15

&lt;210&gt; 92

&lt;211&gt; 12

&lt;212&gt; PRT

&lt;213&gt; Ichthyophthirius multifiliis

&lt;400&gt; 92

Cys Pro Thr Gly Thr Ala Leu Asp Asp Gly Val Thr  
 1 5 10

&lt;210&gt; 93

&lt;211&gt; 13

&lt;212&gt; PRT

&lt;213&gt; Ichthyophthirius multifiliis

&lt;400&gt; 93

Cys Val Lys Cys Lys Pro Asn Phe Tyr Tyr Asn Gly Gly  
 1 5 10

&lt;210&gt; 94

&lt;211&gt; 12

<212> PRT  
<213> Ichthyophthirius multifiliis

<400> 94  
Cys Val Lys Cys Arg Leu Asn Phe Tyr Tyr Asn Gly  
1 5 10

<210> 95  
<211> 11  
<212> PRT  
<213> Ichthyophthirius multifiliis

<400> 95  
Cys Pro Ala Gly Thr Val Leu Asp Asp Gly Thr  
1 5 10

<210> 96  
<211> 11  
<212> PRT  
<213> Ichthyophthirius multifiliis

<400> 96  
Cys Pro Ala Gly Thr Val Leu Thr Asp Gly Thr  
1 5 10

<210> 97  
<211> 19  
<212> PRT  
<213> Ichthyophthirius multifiliis

<400> 97  
Ala Gly Thr Asp Thr Cys Thr Glu Cys Thr Lys Lys Leu Thr Ser Gly  
1 5 10 15

Ala Thr Ala

<210> 98  
<211> 19  
<212> PRT  
<213> Ichthyophthirius multifiliis

<400> 98  
Ala Gly Ile Asp Thr Cys Thr Ser Cys Asn Lys Lys Leu Thr Ser Gly

1 5 10 15

Ala Glu Ala

<210> 99  
<211> 17  
<212> PRT  
<213> Ichthyophthirius multifiliis

<400> 99  
Phe Ala Lys Phe Leu Ser Ile Ser Leu Leu Phe Ile Ser Phe Tyr Leu  
1 5 10 15

Leu

<210> 100  
<211> 17  
<212> PRT  
<213> Ichthyophthirius multifiliis

<400> 100  
Phe Ala Asn Phe Leu Ser Ile Ser Leu Leu Leu Ile Ser Tyr Tyr Leu  
1 5 10 15

Leu

<210> 101  
<211> 12  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Description of Artificial Sequence: short linker  
sequence

<400> 101  
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1 5 10

<210> 102  
<211> 1410



<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: synthetic  
55kD i-antigen coding region

<400> 102

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